

Claims

(Original) 1. A process for treating an electrochemically processed workpiece, the workpiece having a first side, an opposing second side, and a peripheral edge defined between the first and second sides, comprising:

(a) placing the workpiece in a reaction chamber that includes a first chamber portion receiving the first side of the workpiece and a second chamber portion receiving the second side of the workpiece;

(b) supplying a first fluid to the first chamber portion to expose the first side to the first fluid while excluding at least a major portion of the second side from exposure to the first fluid; and

(c) supplying a second fluid to the second chamber portion to expose the second side to the second fluid, wherein at least one of the first and second fluids comprises an etchant for removal of a metal or oxide film from an exposed surface portion of the workpiece.

(Original) 2. The process of Claim 1, wherein first and second fluids are supplied concurrently to the first and second sides of the workpiece.

(Original) 3. The process of Claim 1, wherein the first and second fluids are supplied at differing time periods.

(Original) 4. The process of Claim 1, further comprising exposing the peripheral edge of the workpiece to the first fluid.

(Original) 5. The process of Claim 4, further comprising exposing a perimeter edge portion of the second side to the first fluid.

(Original) 6. The process of Claim 1, wherein at least one of the first and second fluids comprises an inert purge gas.

(Original) 7. The process of Claim 1, wherein at least one of the first and second fluids comprises an aqueous rinse.

(Original) 8. The process of Claim 1, wherein the etchant comprises an acid, selected and supplied at a level sufficient to etch a metal film or oxide film to a predetermined extent, and an oxidizing agent.

(Original) 9. The process of Claim 8, wherein the etchant comprises hydrofluoric acid and hydrogen peroxide.

(Original) 10. The method of Claim 9, wherein the hydrofluoric acid is included at a level of 0.4 to 0.6 weight % and the hydrogen peroxide is included at a level of 5.0 to 15.0 weight %.

(Original) 11. The process of Claim 8, wherein the etchant comprises hydrofluoric acid and ozone in an aqueous solution.

(Original) 12. The process of Claim 10 wherein the hydrofluoric acid is included at a level of 0.4 to 0.6 weight % and the ozone is present in solution at a level of 10 parts per million to an ozone saturated solution.

(Original) 13. The process of Claim 8, wherein the etchant comprises sulfuric acid and hydrogen peroxide.

(Original) 14. The process of Claim 8, wherein the etchant comprises hydrofluoric acid and hydrochloric acid.

(Original) 15. The process of Claim 8 wherein the etchant comprises nitric acid and hydrofluoric acid.

(Original) 16. The process of Claim 1, further comprising excluding the first fluid from at least a major portion of the second side of the workpiece by removing the first fluid from a fluid outlet disposed in the reactor proximate the peripheral edge of the workpiece.

(Original) 17. The process of Claim 1, further comprising excluding the first fluid from at least a major portion of the second side of the workpiece by creating a seal between the first side and the second side.

(Original) 18. The process of Claim 1, wherein the second fluid is supplied concurrently with the first fluid and assists in excluding the first fluid from at least a major portion of the second side.

(Original) 19. The process of Claim 1, wherein the first chamber portion and the second chamber portion are defined by separable first and second reactor members that cooperatively support the workpiece.

(Original) 20. The process of Claim 19, wherein the first and second reactor members are spun together on a common axis during the supplying of the first and second fluids to the workpiece.

(Original) 21. The process of Claim 1, further comprising spinning the reactor chamber and workpiece while supplying the first fluid to etch the surface portion of the workpiece.

(Original) 22. The process of Claim 1, wherein the first and second chamber portions are defined by a unitary reactor housing.

(Original) 23. The process of Claim 1, wherein a metal film is at least partially etched from the first side of the workpiece by the first fluid, the first fluid comprising an etchant.

(Original) 24. The process of Claim 1, wherein the metal film comprises copper.

(Original) 25. The workpiece produced by the process of Claim 1.

(Original) 26. A process for treating an electrochemically processed workpiece, the workpiece having a first side, an opposing second side and a peripheral edge defined between the first and second sides, comprising:

(a) placing the workpiece in a reaction chamber that includes a first chamber portion receiving the first side and a second chamber portion receiving the second side; and

(b) supplying a first fluid to the first chamber portion to expose the first side and the peripheral edge to the first fluid while excluding at least a major portion of the second side from exposure to the first fluid, wherein the first fluid comprises an etchant for removal of a metal film or oxide film from an exposed surface portion of the workpiece.

(Original) 27. The process of Claim 26, further comprising exposing a perimeter edge portion of the second side of the workpiece to the first fluid.

(Original) 28. The process of Claim 26, wherein at least a portion of the first side and peripheral edge of the workpiece are contaminated with copper and the first fluid is an etchant capable of stripping the copper from the workpiece.

(Original) 29. The process of Claim 26, wherein at least a portion of the first side and the perimeter edge are contaminated with cobalt and the first fluid is an etchant capable of etching the cobalt from the exposed surface of the workpiece.

(Original) 30. The process of Claim 26, further comprising treating the first and second sides of the workpiece with a second fluid to remove unreacted cobalt followed by exposing the first side to the etchant.

(Original) 31. The process of Claim 26 wherein at least a portion of the back side and front edge are coated in an oxide film and the first fluid comprises an acidic etchant capable of removing the oxide film from the exposed surface of the workpiece.

(Original) 32. The process of Claim 26, wherein the first chamber portion and the second chamber portion are defined by separable first and second reactor members that cooperatively support the workpiece.

(Original) 33. The process of Claim 32, wherein the first and second reactor members are spun together on a common axis during the supplying of the first and second fluids to the workpiece.

(Original) 34. The process of Claim 26, further comprising spinning the reactor chamber and workpiece while supplying the first fluid to etch the surface portion of the workpiece.

Claims 35-41 (Canceled)

(Currently Amended) 42. The semiconductor workpiece produced by the process of Claim 35 26.

Claims 43-51 (Canceled)

(Original) 52. A process for treating a workpiece, the workpiece having a first side, an opposing second side and a peripheral edge defined between the first and second sides, comprising:

- (a) placing the workpiece in a reaction chamber; and
- (b) supplying a first fluid to the chamber to expose the first side and the peripheral edge to the first fluid while excluding at least a major portion of the second side from exposure to the first fluid.

(Original) 53. A process for treating a workpiece, the workpiece having a first side, an opposing second side, and a peripheral edge defined between the first and second sides, comprising:

- (a) placing the workpiece in a reaction chamber that includes a first chamber portion receiving the first side of the workpiece, a second chamber portion receiving the second

side of the workpiece, and a perimeter portion receiving the peripheral edge, further comprising at least one fluid outlet defined proximate the perimeter portion; and

(b) supplying a first fluid to the first chamber portion to expose the first side to the first fluid while excluding at least a major portion of the second side from exposure to the first fluid, the first fluid flowing from the reaction chamber through the outlet in the perimeter edge portion of the chamber.

(Original) 54. The process of Claim 53, wherein the peripheral edge of the workpiece is exposed to the first fluid before the first fluid flows through the outlet.

(Original) 55. The process of Claim 53, wherein a perimeter edge portion of the second side of the workpiece is exposed to the first fluid before the first fluid flows out through the fluid outlet.

(Original) 56. A process for treating a workpiece, the workpiece having a first side, an opposing second side, and a peripheral edge defined between the first and second sides, comprising:

(a) placing the workpiece in a reaction chamber that includes a first chamber portion receiving the first side of the workpiece, a second chamber portion receiving the second side of the workpiece, and a perimeter portion receiving the peripheral edge; and

(b) supplying a first fluid to the first chamber portion to expose the first side to the first fluid while excluding at least a major portion of the second side from exposure to the first fluid, the first fluid flowing from the reaction chamber out the outlet in the perimeter edge portion of the chamber.

(Original) 57. The process of Claim 56, wherein the first fluid is excluded from the second side by providing at least one outlet defined in the reaction chamber proximate to the perimeter edge portion of the chamber, through which outlet the first fluid flows.

(Original) 58. The process of Claim 56, wherein the first fluid is excluded from the second side by providing a seal included in the reaction chamber and sealing against the peripheral edge of the workpiece.

(Original) 59. The process of Claim 56, wherein the first fluid is excluded from the second side by supplying a second fluid to the second side of the workpiece while supplying the first fluid to the first side of the workpiece.

(Original) 60. An etchant solution for use in etching metal and oxides from an electroplating workpiece, comprising hydrofluoric acid in an amount sufficient to solubilize the oxide or an oxide of the metal, and ozone, in an aqueous carrier.

(Original) 61. The etchant solution of Claim 60, wherein the hydrofluoric acid is included at a level of 0.2 to 0.6% by volume.

(Original) 62. The etchant solution of Claim 61, wherein the hydrofluoric acid is included at a level of 0.4% by volume.

(Original) 63. The etchant solution of Claim 60, wherein the ozone is present in solution at a level of 10 parts per million to an ozone saturated solution.

(Original) 64. The etchant solution of Claim 63, wherein the ozone is present in solution at a level of 20 parts per million.

(Original) 65. A process for treating a workpiece, the workpiece having a first side, an opposing second side, and a peripheral edge defined between the first and second sides, comprising:

- (a) placing the workpiece in a reaction chamber;
- (b) supplying a first fluid to the chamber to expose the first side of the workpiece to the first fluid while excluding at least a major portion of the second side of the workpiece from exposure to the first fluid; and

(c) supplying a second fluid to the chamber to expose the second side of the workpiece to the second fluid, wherein at least one of the first and second fluids comprises an etchant for removal of a metal or oxide film from an exposed surface portion of the workpiece.

(Original) 66. The method of Claim 65, further comprising spinning the workpiece while applying at least one of the fluids to the workpiece.

(Original) 67. The process of Claim 2, wherein the first fluid comprises the etchant and the second fluid comprises an aqueous rinse, the first and second fluids being concurrently supplied to the first and second sides, respectively, during etching of metal or oxide film from the first side of the workpiece.

(Original) 68. The process of Claim 67, further comprising supplying an aqueous rinse to the first and second sides after etching of the metal or oxide film from the first side of the workpiece.

(Original) 69. The process of Claim 68, further comprising spinning the workpiece to remove excess aqueous rinse after rinsing the first and second sides.

(Original) 70. The process of Claim 69, further comprising supplying heated inert gas to the first and second sides to dry the workpiece after spinning the workpiece to remove excess aqueous rinse.

(Original) 71. The process of Claim 67, wherein the etchant is supplied to the first side and the peripheral edge of the workpiece.

Claims 72-79 (Cancelled)